

Earth's Atmosphere and Weather

6-4 The student will demonstrate an understanding of the relationship between Earth's atmospheric properties and processes and its weather and climate. (Earth Science)

6.4.9 Explain the influence of global winds and the jet stream on weather and climatic conditions.

Taxonomy level: 2.7-B Understand Conceptual Knowledge

Previous/Future knowledge: This indicator contains new conceptual material. Students will expand on this knowledge in high school Earth Science as they then develop understanding of the Coriolis effect and also look at the causes and evidence for global climate changes. Students will also study geographic influences attributed to global climate patterns.

It is essential for students to know that *global winds* are found in each convection region (6-4.8).

- Because convection cells are in place in the atmosphere and Earth is spinning on its axis, these global winds appear to curve. This is known as the *Coriolis effect*.
- In the global wind belt regions, the prevailing direction of the winds and how air movement in these large regions affects weather conditions.

Global winds

- The *trade winds* blow from east to west in the tropical region moving warm tropical air in that climate zone.
- The prevailing *westerly winds* blow from west to east in the temperate region.
- The temperate zone temperatures are affected most by the changing seasons, but since the westerly wind belt is in that region, the weather systems during any season move from west to east. Since the United States is in the westerly wind belt, the weather systems move across the country from west to east.
- Tropical weather systems, for example hurricanes, are moved in the prevailing direction of the trade winds. If they enter the westerly wind belt, they are often turned, and move in the direction of that prevailing system.
- The *polar winds* blow northeast to west in the polar region moving cold polar air in that climate zone from the poles toward the west.

Jet stream

- A fast-moving ribbon of air that moves from west to east in the Northern Hemisphere around Earth. It dips and bends and constantly changes positions.
- As these changes occur, air masses and weather systems in its path are moved along by the fast moving air.
- The polar jet stream can bring down cold polar conditions from the north.
- The subtropical jet stream can bring warm tropical conditions from the south (in the northern hemisphere).

It is not essential for students to explain the cause of the jet stream or the global wind belts. The effects of latitude, topography, and elevation on climate patterns are not included in this indicator.

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Assessment Guidelines:

The objective of this indicator is to *explain* the influence of global winds and the jet stream on Earth's weather and climatic conditions; therefore, the primary focus of assessment should be to construct a cause-and-effect model of how weather and climatic conditions are moved by global winds and also how the jet stream moves weather systems in the Northern Hemisphere.

However, appropriate assessments should also require students to *interpret* diagrams related to global winds or the jet stream; *compare* the movement of weather systems between the global wind belts; *identify* the wind belts and their prevailing wind directions; or *recall* the curving of global winds as the Coriolis effect.